(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 015 699**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **80300551.1**

(22) Date of filing: **26.02.80**

(51) Int. Cl.³: **C 10 L 11/04**, C 10 L 11/00

(30) Priority: **02.03.79 GB 7907472**

(43) Date of publication of application: **17.09.80 Bulletin 80/19**

(84) Designated Contracting States: **AT BE CH DE FR IT LU NL SE**

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(54) Fire-lighters, method and apparatus for manufacturing them.

(57) In a method of manufacturing fire-lighters using a hot fire-lighter composition which sets when cool and which has an additive in the form of combustible filler material, the filler material is not added until after the hot fire-lighter composition has been cooled or allowed to cool to a temperature which is above its setting temperature. This enables cooling time to be reduced by an amount which makes it possible to manufacture by a continuous process.

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TITLE MODIFIED
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Fire-lighters and methods of manufacturing them:

The invention relates to fire-lighters and to methods of manufacturing them.

The type of fire-lighter which has been in most general use up to the present time is the so-called white type which utilises an oil in water emulsion which is caused to set by the use of a catalyst. The setting time can be fairly rapid and the fire-lighters can hence be readily manufactured in quantity. However the quantity of paraffin utilised makes these white fire-lighters relatively expensive. More use is now therefore being made of the so-called brown type, which utilise a soap in oil emulsion or gel, the soap being made by the reaction of caustic soda and stearic acid. The emulsion or gel is used to bind together various additives including combustible filler material. The reaction between the caustic soda and the stearic acid takes place at a fairly high temperature, usually in excess of 160°F. This means that when the mixture is poured into moulds it has a fairly long setting time, since it has to cool down, so the manufacturing rate is significantly lower than that of white fire-lighters.

We have been carrying out research with a view to reducing the time taken to manufacture brown fire-lighters, and have discovered that one reason why the hot mixture cools gradually is that the combustible filler materials, for example wood flour, are poor conductors of heat.

Accordingly the invention provides a method of manufacturing fire-lighters, comprising the steps of forming a hot fire-lighter composition which cools when set, cooling or allowing the composition to cool to a temperature which is above its setting temperature, and then adding combustible filler material to the composition.

By keeping the combustible filler material separate from the hot composition while the composition cools, there is no retardant effect on the cooling of the composition, and so the composition cools more quickly than in known processes. Furthermore, the combustible filler material, or other additives, may be chilled before they are mixed with the composition, thereby further accelerating cooling to the setting temperature.

The method according to the invention has been developed for use with hot compositions comprising soap in paraffin emulsions or gels, but the method is also effective to increase production rates with any fire-lighter composition which must go through a hot stage followed by a cooling stage. Other hot compositions may include tars, waxes, and other wax-like materials, stearine and other chemical residues, atactic polypropylene and other plastics wastes.

The combustible filler material may be a carbonaceous material such as wood flour. Other materials may be used as an alternative or in addition, for example sawdust, sander dust, cork, peat, paper, bark, nut shells, husks, straw, lignite, coal, coke, solid smokeless fuels, carbonaceous residues. The filler may be in the form of particles, or pellets, or granules deriving therefrom.

In addition to combustible additives, one or more inorganic materials may be added, to reduce cost, modify weight or performance and/or to assist further

in cooling of the composition by being chilled, e.g. felspar, chalk, limestone, sand, talc, fuller's earth, bentonite, Fly ash, fillite, perlite, vermiculite, mica, calcium carbonate, or sodium bicarbonate.

By way of example, specific embodiments of the invention will now be described, with reference to the accompanying drawings, which are diagrammatic cross-sections through embodiments of apparatus for carrying out embodiments of the method according to the invention.

Referring first to Figure 1, one hundred and sixty five gallons of paraffin are placed in a steam-jacketed pan 10 and steam is supplied to the jacket to heat the paraffin to a temperature of substantially 160°F. Fifteen gallons of molten stearic acid are then added to the pan and the mixture is agitated using paddles 11 rotating at about one hundred and fifty revolutions per minute. Three gallons of 47% W/W caustic soda and eleven gallons of water are then added and the mixture is agitated for a further minute, during which the temperature rises to substantially 170°F and a gel forms. The gel comprises an emulsion or sol of soap in the paraffin, the soap having been formed by the reaction of the caustic soda and the stearic acid.

The gel is pumped from the pan 10 by a pump 12 to a heat exchanger 13. Water flows through the heat exchanger 13 via pipes 14, cooling the gel to a temperature which is just above its setting temperature, the setting temperature being substantially 140°F.

From the heat exchanger 13 the cooled gel passes to a mixing head 15. This mixing head comprises a T-shaped pipe section having arms 16 and 17 and a downwardly extending leg 18. The gel is pumped through the arm 16

towards the leg 18 and at the same time a predetermined quantity of filler materials is driven through the arm 17 by a metering screw 19. The filler materials are chilled by bleeding a cooling agent into the materials through a pipe 20. The gel and the filler materials meet at the upper end of the leg 18 and then pass down the leg. During their passage down the leg 18 they are mixed by paddles 21 driven by a motor 22 mounted on the top of the mixing head. The chilled filler materials bring the gel substantially down to its setting temperature and when the complete fire-lighter mixture emerges from the lower end of the leg 18 and passes into a mould device 23, setting takes place almost immediately. The cooling agent may be such that it vaporises and disperses so that it does not affect the composition of the final mixture. It may for example comprise particles of solid CO_2.

The filler materials comprise combustible filler materials such as wood flour, and inert filler materials may also be included such as sand. The temperature to which the filler materials are cooled is chosen in dependence upon the quantity of filler materials added per batch of gel, and the specific heat of the filler materials.

The mould device 23 may comprise any conventional form of mould device. For example the mould device may comprise a plurality of small moulds which can be passed under the leg 18 or otherwise positioned so that each mould receives a charge of the fire-lighter composition. The use of small moulds will further decrease the setting time. Furthermore the moulded items may already be of convenient size so that there is no need to cut the moulded product on wires or blades, or mould it with breakoff points as with conventional fire-lighters. The advantage

of this is that the filler materials may include coarse fibrous materials. It is not convenient to include coarse fibrous materials in mixtures which must be subsequently cut since the fibres tend to build up on the cutting devices very quickly making them too thick to cut effectively. Furthermore it is not convenient to use coarse fibrous materials in a mixture which is to be moulded with breakoff points, since the fibrous materials tend to hinder the breaking off of one fire-lighter from a stock of fire-lighters forming part of the same block.

The moulds may be arranged on a flat bed, or on a circular drum, or in any other convenient way. If desired, the moulds themselves may be cooled.

In an alternative embodiment, shown in Figure 2, instead of mixing the ingredients of the gel in the steam-jacketed pan 10, a continuous mixing process is used. Kerosine and stearine are respectively fed through pipes 24 and 25 at controlled rates to a closed steam-jacketed vessel 26, where they are mixed at a temperature of substantially 160°F by a paddle 27. The mixture is then fed to a second closed steam-jacketed vessel 28, to which caustic soda and water are added at a controlled rate through pipes 29 and 30 respectively.

The contents of the second chamber 28 rise and are mixed by paddle 31 during rising, and by the time the mixture has reached the top of chamber 28 it has gelled and then overflows to the pump 12 and the heat exchanger 13.

Figure 3 shows yet another embodiment, in which the contents of a kerosine and stearine tank 32 and a caustic soda and water tank 33 are fed separately to a mixer tank 34. The tanks 32 and 34 may be closed or fitted with reflux condensers.

The pump 12 is connected to a two way valve 35 so that mixture may be supplied through pipe 36 when required or can be recirculated to tank 34. The pipe 36 leads to a wide throat mono pump 37 and the throat of the pump may also be supplied with filler 38. The filler is stored in a hopper 39 having a sluice gate. The bottom of the hopper comprises a belt conveyor 40 arranged to feed filler to the throat of the pump 37. Vibratory feed to the belt may be provided.

From the pump 37 the mixture with added filler is passed through a heat exchanger 41 to the mould 23.

Typical flow rates may be as follows:-

Kerosine	500 to 600 gallons per hour	(e.g. 534.4)
Stearine	40 to 50 gallons per hour	(e.g. 42.4)
Caustic Soda	8 to 12 gallons per hour	(e.g. 9.87)
Water	30 to 40 gallons per hour	(e.g. 35.8)
Wood flour and/or other solids	Up to 2000 lbs per hour	(e.g. 860.4)

The invention is not restricted to the details of the foregoing embodiments. For instance any known continuous moulding technique may be applied to the mixture issuing from the apparatus. For instance continuous strip moulding, slat moulding, or extrusion may be employed. If the composition does not contain substances which make cutting difficult, moulding may for example be carried out on a moving belt, individual fire-lighters being cut off from the continuously moulded product by a flying knife. A plurality of moulds on a roundabout may be used.

The cooling agent bleed pipe 20 may be replaced by another heat exchanger, so that the cooling agent remains separate. Means may be provided to cool the filler fed to the pump 37 in Figure 3, before reaching the pump.

Claims:

1. A method of manufacturing fire-lighters using a hot fire-lighter composition which sets when cool and which has an additive in the form of combustible filler material, characterised in that the hot fire-lighter composition is cooled or allowed to cool to a temperature which is above its setting temperature before the combustible filler material is added.

2. A method as claimed in Claim 1, in which the combustible filler material, or other additives, are chilled before they are mixed with the composition, thereby further accelerating cooling to the setting temperature.

3. A method as claimed in Claim 1 or Claim 2, in which the hot composition comprises a soap in paraffin emulsion or gel.

4. A method as claimed in Claim 1 or Claim 2, in which the hot composition includes one or more of the following: tars, waxes, wax-like materials, stearine or other chemical residues, atactic polypropylene or other plastics wastes.

5. A method as claimed in any one of Claims 1 to 4, in which combustible filler material comprises one or more of the following: wood flour or other carbonaceous material, sawdust, sander dust, cork, peat or paper.

6. A method as claimed in any one of Claims 1 to 5, in which the combustible filler material includes one or more of the following: bark, nut shells, husks, straw, lignite, coal, coke, solid smokeless fuels, carbonaceous residues.

7. A method as claimed in any one Claims 1 to 6, in which the combustible filler is in the form of particles, pellets, or granules.

8. A method as claimed in any one of the preceding claims in which other inorganic material is added in addition to combustible filler.

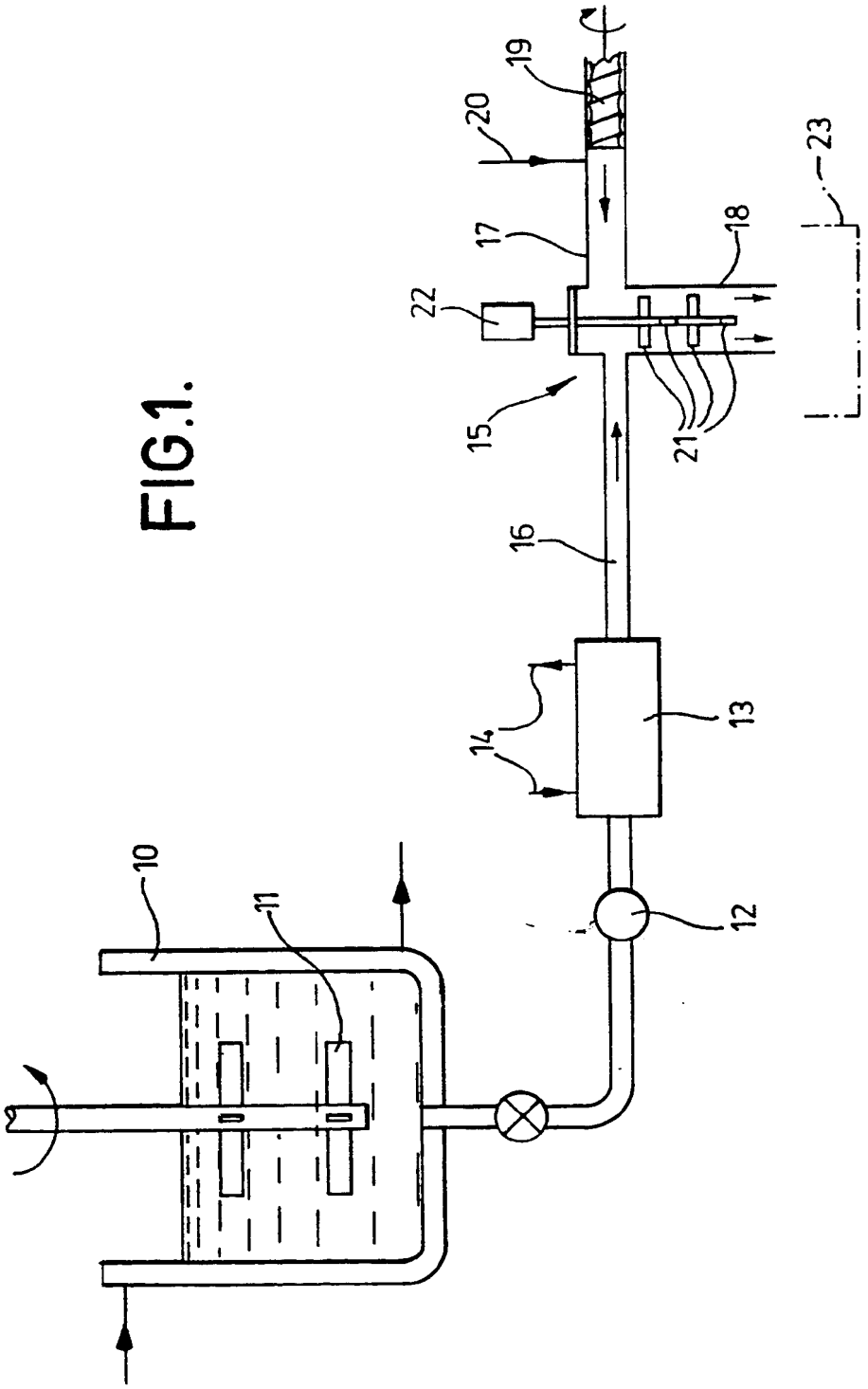
9. A method as claimed in Claim 8, in which the inorganic material includes one or more of the following: felspar, chalk, limestone, or sand.

10. A method as claimed in Claim 8 or Claim 9, in which the inorganic material includes one or more of the following: talc, fuller's earth, bentonite, Fly ash, fillite, perlite, vermiculite, mica, calcium carbonate, sodium bicarbonate.

11. Apparatus for carrying out the method of Claim 1, comprising means (10, 13, 16) for holding the hot fire-lighter composition while the composition is cooled or allowed to cool, means (17) for holding a supply of combustible filler material, and means (18, 21, 22) for mixing the composition and filler together when the composition has cooled to a temperature above its setting temperature.

12. A fire-lighter when manufactured by the method claimed in any one of claims 1 to 10, or by the apparatus claimed in Claim 11.

FIG.1.



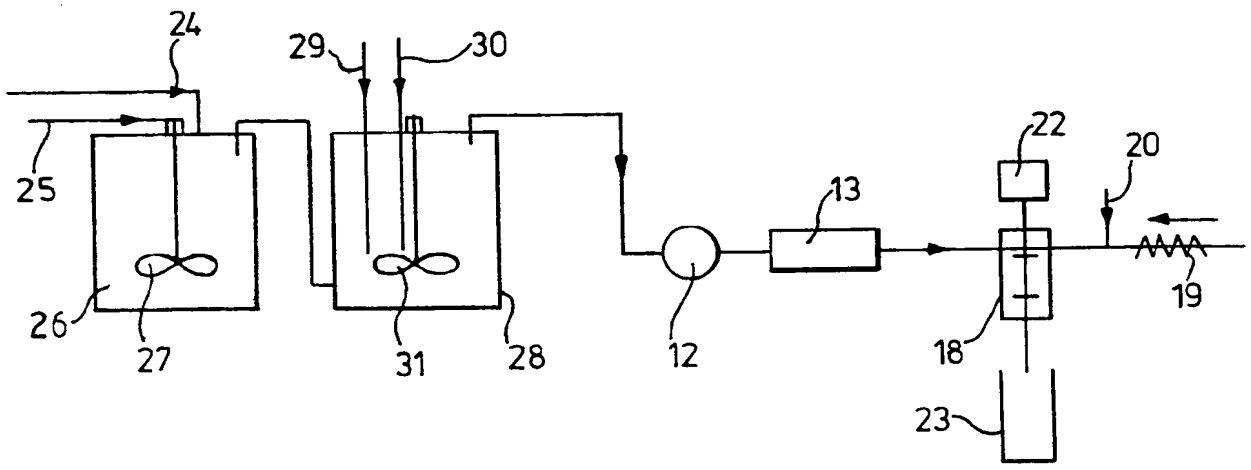

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FIG.2.

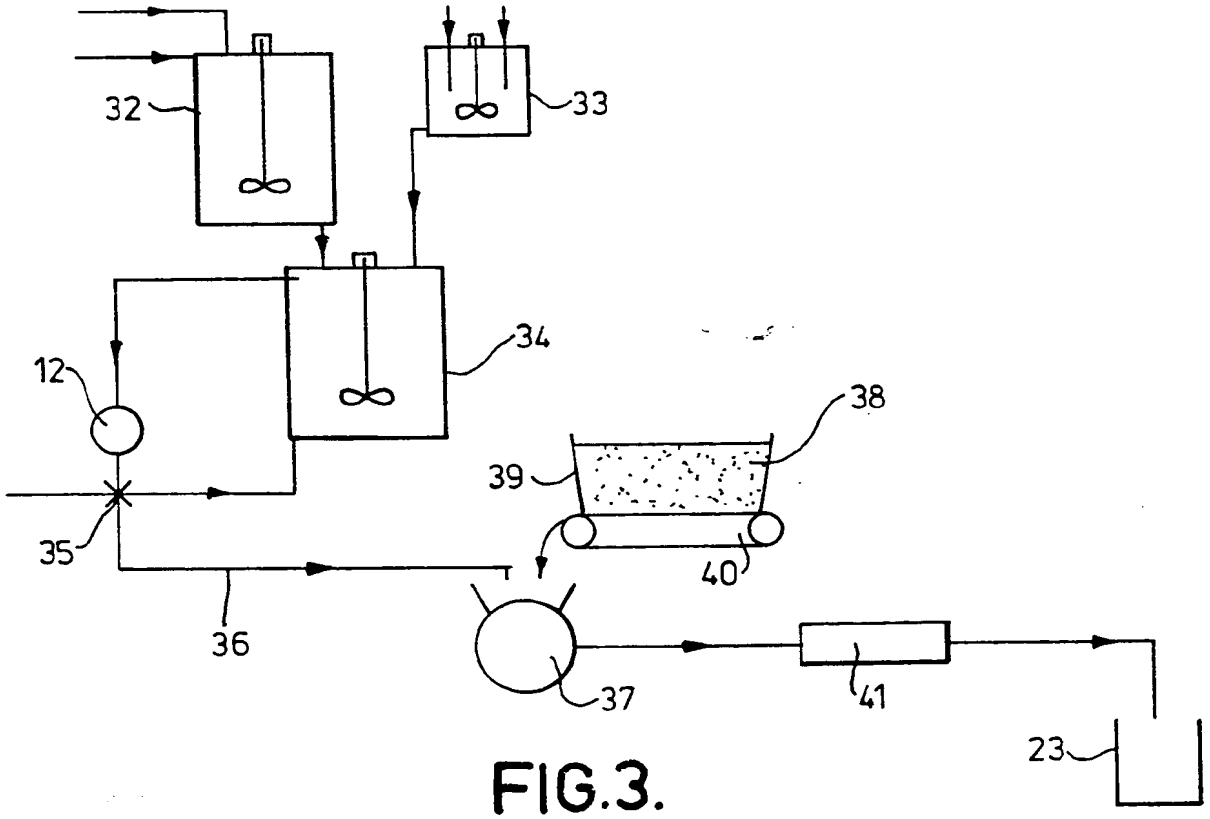
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FIG.3.

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EUROPEAN SEARCH REPORT

0015699
Application number
EP 80 30 0551

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	GB - A - 569 709 (LUZZATTO) * Claims 1-5; page 2, lines 12-18 *	1
A	GB - A - 608 062 (LORD) * Claims 1-5; page 4, lines 12-35; page 5, lines 23-28 *	1
A	GB - A - 635 696 (ALDOUS) * Claims 1-3 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.)

C 10 L 11/04
11/00

TECHNICAL FIELDS SEARCHED (Int.Cl.)

C 10 L 11/04
11/02
11/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E. conflicting application
D: document cited in the application
L. citation for other reasons

&. member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	03-06-1980	MEERTENS

EPO Form 1503.1 06.78